

**Contact Info:**

Douglas Mahone, Partner
Heschong Mahone Group
11626 Fair Oaks Blvd. #302
Fair Oaks, CA 95628

Time Dependent Valuation (TDV) Economics

California Building Energy Efficiency Standards Revisions for July 2003 Adoption

October 26, 2001

Time Dependent Valuation (TDV) - Economics

Description

Time Dependent Valuation (TDV) provides a new foundation for Title 24 measure analysis. TDV applies an hour-by-hour factor to energy savings (8760 hours in a full year). This factor reflects the life cycle value of energy savings, and it varies by time of day, day of week, time of year, climate zone, type of fuel (electricity, natural gas or propane), building type (residential or nonresidential) and outdoor temperature. It values energy savings more during on-peak times than during off-peak times. This is a fundamental change from the current, flat-rate basis for the efficiency standards, which does not differentiate savings valuation by time of use. Adoption of TDV as the basis for California's efficiency standards will encourage building designs and equipment selections which use less on-peak energy.

Benefits

Over the long run, TDV-based efficiency standards will reduce peak demands on California's energy systems, resulting in system cost savings that will benefit all ratepayers. In addition, owners of buildings built to the new efficiency standards will be less vulnerable to high peak demand charges. TDV will also encourage the manufacture and use of equipment which performs better under peak temperature conditions. These changes will not reduce comfort, indoor air quality, productivity or property valuation.

Environmental Impact

TDV will likely produce long term reductions in on-peak power plant emissions by reducing peak demands from buildings. TDV will encourage such peak demand reduction strategies as gas cooling, but only to the extent

these technologies are viable in the marketplace. Other than these, we do not foresee any major changes in environmental factors resulting from adoption of TDV.

Type of Change

TDV would have two effects on the Standards. First, as the new basis for Title 24, it would be used to calculate the cost effectiveness of required and optional measures, at the time new measures are considered for adoption. Second, once adopted into the standards, TDV would become a part of the computer tools used under the performance approach. This would be implemented as a change to the ACM Manual and the compliance tools. The certified computer programs would calculate hourly energy savings between the proposed and budget building designs, and would apply an hourly TDV factor to each savings value. The annual sums of these two savings would be determined and, if the proposed total does not exceed the budget total, the building would comply. These calculations would be transparent to the end users in the compliance process.

The prescriptive approach would only be affected to the extent that different packages of measures are adopted based on their TDV performance. The overall stringency of the existing standards would not be affected by TDV, because the annual value of energy under TDV has been benchmarked to the annual value of energy adopted for use in development of the 1992 (and subsequent) editions of the Standards.

Adoption of TDV would require substantial modifications to the ACM Manual and the compliance programs. The most substantial changes would be to the residential analysis methods, which would change from annual performance of measures to hourly performance (e.g. hour-by-hour HVAC equipment models and water heating usage). These changes are the subject of companion code change proposals prepared by the TDV development team. The Manuals would need some additional material to explain the concepts and consequences of TDV to designers and the compliance community. Exceptional methods would need to be updated to account for the hourly analysis requirements of TDV.

Measure Availability and Cost

Because it is not a single measure or piece of hardware, measure availability and cost does not apply directly to TDV. To the extent certain measures become more highly valued under TDV than they currently are valued, these issues may become pertinent to those measures. Overall, however, TDV will not produce a large change in the way buildings are designed and built.

Useful Life, Persistence and Maintenance

Because it is not a single measure or piece of hardware, useful life, persistence and maintenance do not apply directly to TDV. However, some kinds of measures will be given greater encouragement than they have been under the flat-rate valuation of the existing standards. For example, thermal energy storage (TES) systems will likely be given greater credit than Title 24 currently gives them. This means that they may have a trade-off advantage over other measures, such as insulation or improved glazing. To the extent that a TES system may have a shorter useful life, less persistence and more maintenance than insulation or glazing, these issues may need to be revisited if TDV is adopted. It may be desirable to adjust the ACM rules that govern these trade-offs to require a performance degradation factor of some sort to be assigned to measures with shorter useful lives, less persistence or higher maintenance.

Performance Verification

Performance verification does not apply to TDV.

Cost Effectiveness

The TDV methodology itself is not subject to a cost effectiveness analysis. Rather, TDV will provide a new basis for calculating the cost effectiveness of measures.

Analysis Tools

The TDV development team has prepared special purpose versions of MICROPAS and EnergyPro, supplemented by Excel spreadsheets, which implement the TDV method on top of the current compliance regime. These are prototyping tools, which allow people familiar with the current performance method to see how the results will be changed by TDV. Ultimately, the certified performance method computer tools would have to be adjusted to incorporate TDV algorithms. This changes would require only minor changes to the user inputs or the compliance reports.

In addition, a TDV Cookbook has been prepared, which documents the derivation of the TDV methods and provides spreadsheets for the derivation calculations.

Relationship to Other Measures

TDV will affect all measures under Title 24. It will be a choice of the Commission whether or not to revisit the cost effectiveness of measures that are already adopted under Title 24, or to limit TDV cost effectiveness calculations to new measures and to performance trade-off calculations.

Bibliography and Other Research

The TDV methodology has been developed over the past several years by a consultant team funded and lead by PG&E, with support and active participation by the CEC staff, Southern California Edison, Southern California Gas Co., and other interested parties.

The results of this analysis has been published in a series of reports, all of which are posted on the TDV Project web site at: www.h-m-g.com/tdv/index.htm.

Key documents available at that location include:

Questions about the TDV methodology may be addressed to:

PG&E: Gary Fernstrom (415) 973-6054 gbf1@pge.com

HMG: Douglas Mahone (916) 962-7001 dmahone@h-m-g.com